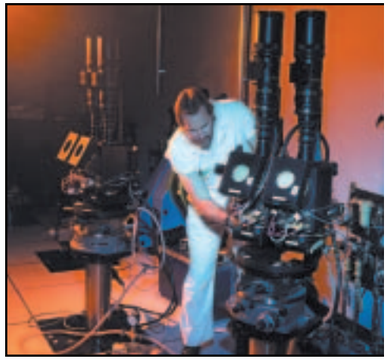

Improving Implosion Images

In 1985, Livermore completed the Bunker 801 project to upgrade what was in fact the very first facility (then called Bunker 301) at Site 300, the Laboratory's remote experimental test site. The newly refurbished bunker—actually a complex of protected enclosures, largely underground—became a fully modernized hydrodynamic test facility to gather data crucial for assessing the operation of a nuclear weapon's primary stage. Until project completion, weapon designers relied largely on technologies from the 1960s for much of their hydrodynamics experimentation.

After the upgrade, Bunker 801 contained the most modern diagnostics available. They included a Fabry–Perot interferometer to measure the velocity of explosion-driven surfaces, 10 high-speed cameras to capture the progressive movement of a pit's outer surface, and an electrical-probe diagnostics system for recording data from hundreds of shorting pins that time the arrival of the interior surface. Additionally, an important diagnostic tool was the Flash X Ray (FXR), a 16-megaelectronvolt linear-induction accelerator (see Year 1960 on the development of linacs). Electrons from the FXR strike a target to produce an intense burst of x rays, which are used to image a mock nuclear weapon primary as it implodes. Built between 1978 and 1982, the FXR produced five times the x-ray dose of previous machines in one-third the pulse length. Much denser objects could be radiographed and with less blur because of the shorter pulse.

Continual upgrades to Bunker 801 since 1985 have kept the facility equipped with the most modern capabilities. For example, in the 1990s, Laboratory scientists and engineers improved the beam quality of the FXR so that a higher overall x-ray dose is produced. More recently, a double-pulse feature was added to take two radiographs in one experiment. In addition, the Laboratory developed a gamma-ray camera to record the radiographic images produced. The system is 70 times more sensitive than the radiographic film it replaced. With these upgrades, scientists in 1998 were able to carry out the first "core punch" experiments on mock pits for two stockpiled weapons—the W76 submarine-launched ballistic missile warhead and the B83 strategic bomb. In core punches, images are obtained of the detailed shape of the gas cavity inside a highly compressed pit.

In 2001, Bunker 801 became the Contained Firing Facility after another major upgrade, the addition of a firing chamber to the complex. The debris from test explosions is contained in a more environmentally benign manner than ever—dramatically reducing particle emissions and minimizing the generation of hazardous waste, noise, and blast pressures. With walls up to 2 meters thick and protected by steel plating, the firing chamber is designed to withstand repetitive tests that use up to 60 kilograms of high explosives.

Before completion of the Contained Firing Facility in 2001, tests at the Bunker 801 complex were conducted outdoors (top left). Now the complex (far left) includes an indoor firing chamber (right), which will contain debris and minimize the environmental consequences of tests that use up to 60 kilograms of high explosives. The facility is equipped with the latest diagnostics, including electronic image-converter framing cameras (middle).